

# Engineering Specification Report

*Plant Design Document Analysis*

Generated: December 16, 2025 at 10:50:01

## ENGINEERING SPECIFICATION ANALYSIS

Focus Area: Entire Document

Generated on December 16, 2025

- Purpose and Scope of Documents
- Governs nozzle load analysis for tank shell openings and vendor deliverable requirements for nozzle load analysis during manufacturing & site erection (From 10080-1-SS-ME-004, 12.2.viii; Appendix P).
- Establishes tank design to API 650 and its Supplement, including mandatory use of API 650 Appendix P for allowable external loads on tank shell openings (From 10080-1-SS-ME-004, Appendix P; 10080-1-SS-ME-004 referencing API 650 & Supplement).
  - Applies to evaluation of external nozzle and support pad loading acceptability for CONTRACTOR confirmation relative to tank design (design/procurement/erection acceptance responsibility) (From 10080-1-SS-ME-004, Appendix P, P.1.1).
  - Specifies software accepted for piping stress / nozzle analysis for design and analysis activities (CAESAR, NOZZLEPRO, CAEPIPE) (From BEDD EPCMD-1-DBD-GE-001, Section 5.2).
  - Defines units and conventions to be used for loads, moments and pressures in analyses and reporting (Force = N, Moment = Nm, Linear loading = kN/m, Surface loading = kN/m<sup>2</sup>, Pressure = kg/cm<sup>2</sup> g) (From BEDD Section 6 Units).
- Applicable Codes, Standards, and References
  - API 650 (general) (From 10080-1-SS-ME-004 referencing API 650 & Supplement).
  - API 650 Appendix P (mandatory for allowable external loads on tank shell openings) (From 10080-1-SS-ME-004, Appendix P — "This appendix is mandatory...").
  - IS 875 (Part 3) — wind design standard (From BEDD EPCMD-1-DBD-GE-001, section 5.2.2)

addition).

- IS 1893 — seismic design standard; tanks Appendix E references IS 1893 / IITK-GSDMA guidance (From BEDD and 10080-1-SS-ME-004 Appendix E).
- EPCMD-1-ENGG-DBD-CS-002 — soils and spectra reference for seismic (From BEDD 7.1 Note).
  - CAESAR, NOZZLEPRO, CAEPIPE — accepted analysis software list (From BEDD EPCMD-1-DBD-GE-001, section 5.2).
  - Document: 10080-1-SS-ME-004 (contains Appendix P and vendor requirements) (From file header and internal references).
  - Document: BEDD EPCMD-1-DBD-GE-001 (contains wind, software, units information) (From BEDD EPCMD-1-DBD-GE-001, Sections 5.2 and 6).
- Design and Performance Requirements
  - Use API 650 Appendix P nozzle allowable loads at nozzle-to-shell junction as minimum requirements for shell-mounted nozzle design (From 10080-1-SS-ME-004, Appendix P).
  - CONTRACTOR to confirm acceptability of specified external nozzle and support pad loading or advise maximum acceptable loading for the tank design (From 10080-1-SS-ME-004, Appendix P, P.1.1).
  - Wind design parameters for nozzle load evaluation: site wind speed = 50 m/s, terrain category 2, Group B, K1 = 1.08, K2 = 1.1, K3 = 1.0, shape factor = 0.7 (From BEDD EPCMD-1-DBD-GE-001, section 5.2.2 addition).
  - Seismic design to comply with IS 1893 (and IITK-GSDMA guidance where referenced) for tanks (From BEDD and 10080-1-SS-ME-004 Appendix E).
    - Report loads using specified units: Forces in N, Moments in Nm, Linear loading in kN/m, Surface loading in kN/m<sup>2</sup>, Pressures in kg/cm<sup>2</sup> g (From BEDD Section 6 Units).
- Material and Component Specifications
- None found explicitly in the provided documents. (From provided files)
- Loads, Allowables, and Design Data
  - Nozzle allowable loads (at nozzle-to-shell junction) for 3" nozzle: Radial load = 1000 N; Circumferential moment = 200 Nm; Longitudinal moment = 200 Nm (From 10080-1-SS-ME-004, Appendix P).
  - Nozzle allowable loads for 4" nozzle: Radial load = 1500 N; Circumferential moment = 300 Nm; Longitudinal moment = 300 Nm (From 10080-1-SS-ME-004, Appendix P).
  - Nozzle allowable loads for 6" nozzle: Radial load = 2500 N; Circumferential moment = 700 Nm; Longitudinal moment = 700 Nm (From 10080-1-SS-ME-004, Appendix P).
  - Nozzle allowable loads for 8" nozzle: Radial load = 4000 N; Circumferential moment = 1500 Nm; Longitudinal moment = 1500 Nm (From 10080-1-SS-ME-004, Appendix P).
  - Nozzle allowable loads for 10" nozzle: Radial load = 5000 N; Circumferential moment = 2500 Nm; Longitudinal moment = 2500 Nm (From 10080-1-SS-ME-004, Appendix P).
  - Nozzle allowable loads for 12" nozzle: Radial load = 7000 N; Circumferential moment = 4000 Nm; Longitudinal moment = 4000 Nm (From 10080-1-SS-ME-004, Appendix P).
  - Nozzle allowable loads for 14" nozzle: Radial load = 9000 N; Circumferential moment = 6000 Nm; Longitudinal moment = 6000 Nm (From 10080-1-SS-ME-004, Appendix P).

Nm; Longitudinal moment = 6000 Nm (From 10080-1-SS-ME-004, Appendix P).

- Nozzle allowable loads for 16" nozzle: Radial load = 11000 N; Circumferential moment = 8000

Nm; Longitudinal moment = 8000 Nm (From 10080-1-SS-ME-004, Appendix P).

- Nozzle allowable loads for 18" nozzle: Radial load = 13000 N; Circumferential moment = 10000

Nm; Longitudinal moment = 10000 Nm (From 10080-1-SS-ME-004, Appendix P).

- Nozzle allowable loads for 20" nozzle: Radial load = 15000 N; Circumferential moment = 13000

Nm; Longitudinal moment = 13000 Nm (From 10080-1-SS-ME-004, Appendix P).

- Nozzle allowable loads for 24" nozzle: Radial load = 20000 N; Circumferential moment = 18000

Nm; Longitudinal moment = 18000 Nm (From 10080-1-SS-ME-004, Appendix P).

- Note: Loads for nozzles  $\leq$  2" are considered negligible (From 10080-1-SS-ME-004, Appendix P).

• Note: Loads for nozzles  $>$  24" to be agreed between CONTRACTOR and CONSTRUCTION MANAGER (From 10080-1-SS-ME-004, Appendix P).

- Wind design value: 50 m/s 3-second gust at 10 m elevation (50-year return) (From BEDD 7.2.1).

• Wind coefficients: K<sub>1</sub> = 1.08; K<sub>2</sub> = 1.1; K<sub>3</sub> = 1.0; shape factor = 0.7 (From BEDD EPCMD-1-DBD-GE-001, section 5.2.2 addition).

• Seismic design reference: IS 1893 compliance required; soils and spectra per EPCMD-1-ENGG-DBD-CS-002 (From BEDD 7.1 Note).

• Battery limit steam pressures and temperatures (Attachment 3, Steam Battery Limit Conditions): HHP Steam Normal = 106 kg/cm<sup>2</sup>g (range 101–109); Normal temp = 510°C (range 490–515); Design pressure = 117 kg/cm<sup>2</sup>g; Design temp = 540°C (From Attachment 3, Steam Battery Limit Conditions).

• HP Steam Normal = 42.2 kg/cm<sup>2</sup>g (40.1–43.2); Normal temp = 383°C; Design pressure = 47.6 kg/cm<sup>2</sup>g; Design temp = 426°C (From Attachment 3, Steam Battery Limit Conditions).



*End of Report*